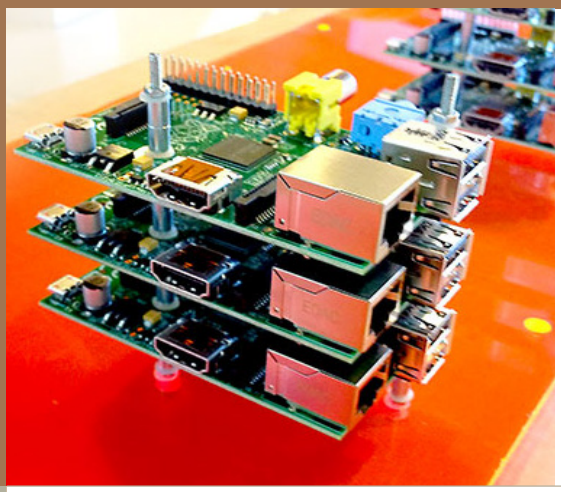
APRIL — 09 — 2014 | VOLUME 03. ISSUE 01

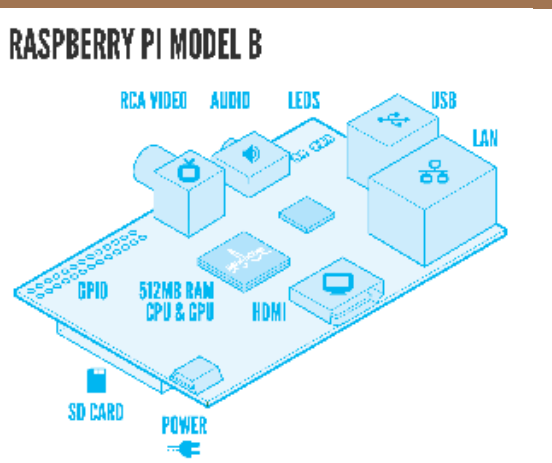
CS BITS & BYTES

HIGHLIGHTING INNOVATIVE COMPUTER SCIENCE RESEARCH

Computing with a different kind of fruit

Raspberry Pi helps millions around the world learn the basics of computer science





ABOVE IMAGES

LEFT: RASPBERRY PI CLUSTER RACK THAT DRIVES THE SDSC SANDBOX TILED DISPLAY WALL.
(IMAGE FROM RICK WAGNER AND BEN TOLO, SDSC)

RIGHT: DIAGRAM OF RASPBERRY PI MODEL B.
(IMAGE COURTESY OF RASPBERRY PI)

"The low cost of the Raspberry Pi means that each student can have dedicated access to his or her own small cluster for exploring. Meteor could then serve as a stage for students to present their work or test it on a larger scale."

RICK WAGNER
SAN DIEGO SUPERCOMPUTING CENTER

Apples and Blackberries aren't the only choices you have in the microprocessing fruit aisle. Raspberry Pi has been added to the mix and is helping to teach basic computer science in schools.

The Raspberry Pi was created as a cheap, accessible and programmable computer. With a convenient platform for hands-on access to demonstrate computer basics, it has been used around the world to help students understand how computers work. Since the introduction of the Raspberry Pi in 2011, more than two million units have been sold.

The motherboard, processor and circuitry are all visible, and a variety of ports are available to connect to input and output devices like routers, storage devices, keyboards, mouses, monitors, and printers.

In addition to providing a simple look at hardware basics, the Raspberry Pi allows students to experiment with and demonstrate many different computing activities. It has all the components of a full computer system but its minimalist design allows for less intensive, portable applications. Using the Raspberry Pi, you can: make an Internet browser or portable gaming station, create a streaming multimedia player, build a touchscreen tablet, or create an application to control appliances in the home.

Recently, computer scientists at the San Diego Supercomputer Center (SDSC) built a Linux cluster called *Meteor* by linking 16 Raspberry Pi units together. Rick Wagner and his colleagues used *Meteor* at the Supercomputing'13 conference to run a hands-on gaming competition for students to learn about the benefits of parallel programming, where many computers work together to solve challenging problems.

Working with high school and undergraduate students, the team developed hybrid applications that used both the Raspberry Pi's CPUs (central processing units) and GPUs (graphic processing units) to speed up the computer's ability to solve problems.

Who does this stuff ?

Rick Wagner, the manager for high-performance computing systems at the San Diego Supercomputing Center, led the design and deployment of *Meteor* with the help of undergraduates from the University of California, San Diego and his 10-year-old son, Kodiak. *Meteor's* purpose is to educate kids and adults about parallel computing by providing an easy-to understand, tangible model of a computer cluster. When not working with supercomputers, Dr. Wagner researches turbulence in supersonic fluids and rides his motorcycle along California's coast.

RICK WAGNER

TRY THIS OUT

Increase your knowledge of how computers evolved with the following activity:

1

Read the Raspberry Pi origination story from "About Us" in the website:

> http://www.raspberrypi.org/about

2

Discuss the following questions:

A. According to the creators of the Raspberry Pi, what changed about computing from the 1990's to the 2000's that reduced computer literacy among college students?

B. Explain the difference between knowing how to work a computer versus knowing how a computer works.

C. In what ways does a portable computing system the size of a credit card have the potential to change computer usage?

ABOVE IMAGE

SDSC DEMONSTRATED THE METEOR CLUSTER AND TILED DISPLAY WALL AT THE SUPERCOMPUTING'13 CONTEST AND HOSTED A GAMING COMPETITION FOR PARTICIPANTS.

(IMAGE FROM RICK WAGNER AND BEN TOLO, SDSC)

Learn More

The Raspberry Pi Foundation

> http://www.raspberrypi.org

25 Fun things to do with a Raspberry Pi

CNET/UK . David Hayward . Nov. 28, 2012. Updated Mar. 14, 2014.

> http://www.cnet.com/how-to/25-fun-things-to-do-with-a-raspberry-pi/

San Diego Supercomputing Center

> http://www.sdsc.edu

Rich Wagner

> http://www.guardian72.com/p/about-rick.html

ABOUT

CS Bits & Bytes is a bi-weekly newsletter highlighting innovative computer science research. It is our hope that you will use CS Bits & Bytes to engage in the multi-faceted world of computer science to become not just a user, but also a creator of technology. Please visit our website at: www.nsf.gov/cise/csbytes.

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